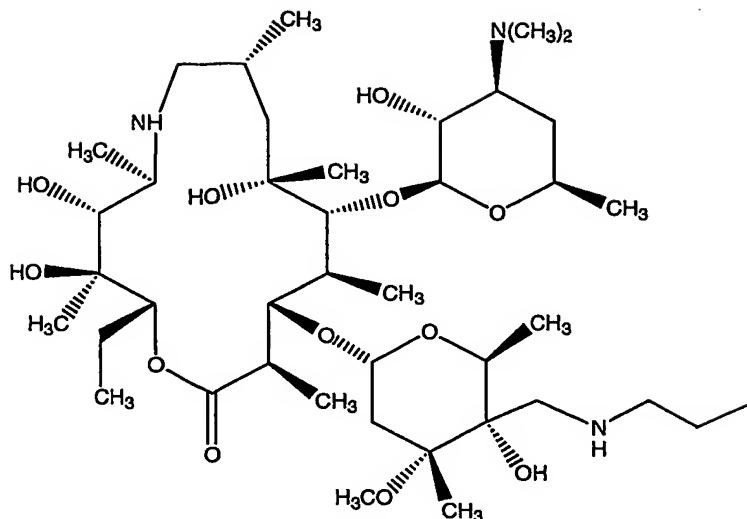


Claims

The claimed invention is:

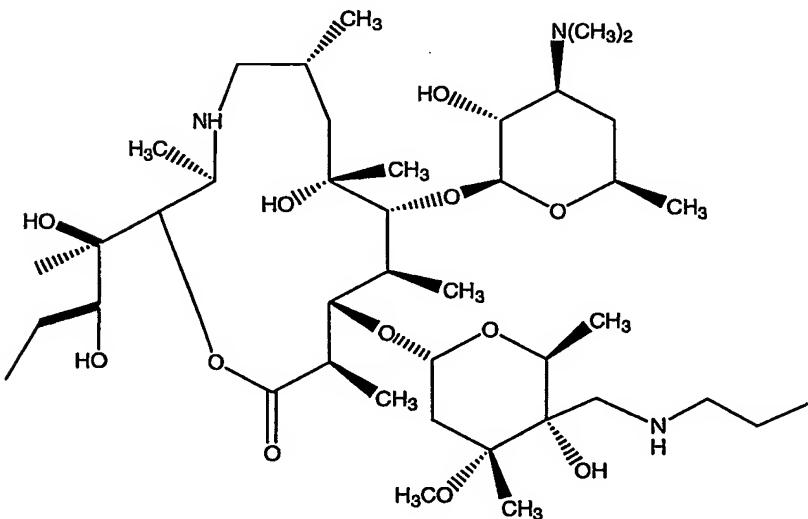
1. An adjuvant composition comprising one or more antimicrobial agents.
- 5 2. An adjuvant composition of claim 1 for use in a human vaccine.
3. An adjuvant composition of claim 1 for use in a non-human animal vaccine.
4. A human or non-human animal vaccine comprising at least two components, 10 with the two components administered either concurrently, or co-administered within a month, where the first component is an adjuvant comprising one or more antimicrobial agents and the second component is one or more antigenic agents.
5. A vaccine of claim 4 where the antimicrobial agent is a macrolide or beta-15 lactam antibiotic.
6. A vaccine of claim 4 where the vaccine is for non-human animals, where the antimicrobial agent is a macrolide antibiotic such as tulathromycin sold under the trade name Draxxin® or a beta lactam antibiotic, such as a cephalosporin, such as 20 ceftiofur, and where the antigenic agent is selected from one or more from the group consisting of a *M. haemolytica* antigen, a *M. haemolytica* leukotoxin, a *M. haemolytica* capsular antigen, a *M. haemolytica* soluble antigen, or a mixture thereof.
- 25 7. An adjuvant composition of claim 1 where said antimicrobial agent is comprised of at least one azalide selected from the group consisting of an 8a-azalide and a 9a-azalide, wherein said azalide acts as an adjuvant.
8. An adjuvant composition of claim 1, wherein said azalide is a 9a-azalide 30 selected from the formula I:



I

9. An adjuvant composition of claim 4, further comprising a compound of formula II:

5



II

10. An adjuvant composition of claim 9, comprising (a) a mixture of compounds of formulae I and II in a ratio of about 90% ± 10% to about 10% ± 10%, respectively; (b) water; and (c) one or more acids present at a total concentration of from about 0.2 mmol to about 1.0 mmol per mL of the

5

11. A vaccine comprising any of the antimicrobial adjuvant compositions of claims 7-10 administered either concurrently or co-administered with an antigen.

12. A vaccine of claim 11 administered either concurrently or co-administered with 10 an antigen selected from any *M. haemolytica* antigen with an adjuvant composition of claim 10, wherein said 9a-azalide is a composition comprising (a)(i) a mixture of compounds of formulae I and II in a ratio of about 90% ± 10% to about 10% ± 10%, respectively; (ii) water; and (iii) one or more acids present at a total concentration of from about 0.2 mmol to about 1.0 mmol per mL of the composition; and (b) one or 15 more water-miscible co-solvents present in an amount of from about 250 to about 750 mg per mL of the composition.

13. A vaccine administered either concurrently or co-administered with any of the 20 an antigen selected from any *M. haemolytica* antigen with an adjuvant composition comprising any ceftiofur.

14. A method for enhancing, increasing, upwardly modulating, diversifying or otherwise facilitating an immune response in an animal to an antigen comprising administration of an antimicrobial agent to an animal.

25

15. A method of claim 14 where the antimicrobial agent is at least one adjuvant component of a concurrent administration of an antimicrobial agents and an antigen, where the antimicrobial agent is selected from the antimicrobial agents described herein, and where the antigenic agents are described herein.

30

16. A method of claim 14 where the antimicrobial agent is at least one adjuvant component of a co-administration of an antimicrobial agents and an antigen, where the

antimicrobial agent is selected from the antimicrobial agents described herein, and where the antigenic agents are described herein.

17. A method of preventing a disease caused by a pathogenic agent, cancerous cell, or allergen in an animal comprising the step of administering the adjuvant compositions or vaccines described herein and in claims 1-14 to an animal susceptible to said disease.

18. A kit comprising the adjuvant or vaccines of claims 1-14, where the components of the kit has either an antimicrobial agent or an antigenic agent or both and where said components that can be either co-administered or concurrently administered, with instructions for use thereof.

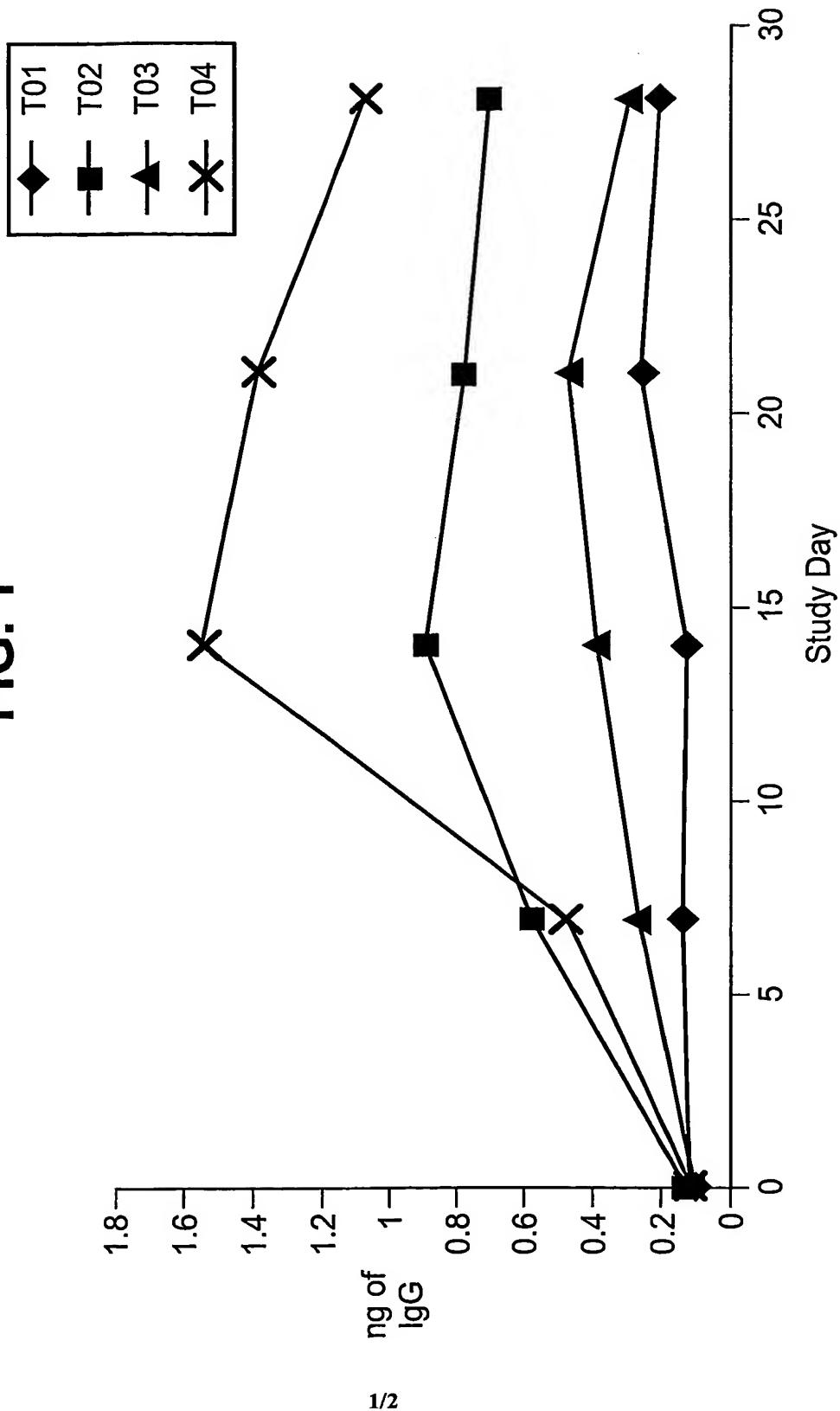
FIG. 1

FIG. 2